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AF/1700

Patent

Docket No: 55270US002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Mark A. STROBEL, Christopher S. LYONS, Group Art Unit: 1773
Donald J. McCLURE, Mark D. NACHBOR
and John R. PARK

Serial No.: 09/724,615

Filed: November 28, 2000

Examiner: Monique R. Jackson

For: FLAME-TREATING PROCESS

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RESPONSE TO FINAL REJECTION

Commissioner for Patents
Washington, DC 20231

Dear Sir:

An interview granted the undersigned attorney and one of the inventors, Dr. Mark A. Strobel, on November 19, 2002, is acknowledged with appreciation. Reconsideration of the rejection stated in the Office Action mailed August 26, 2002, is requested in view of the reasons presented at the interview, which are formally submitted below.

The rejection is based on Asakura et al, U.S. Pat. 4,645,702, particularly, column 9, lines 48-60. The cited section of Asakura describes treatments for improving the adhesion of a polymeric film to a metal layer coated on the film. A key statement in the cited section is the following:

As the chemical treatment, a corona discharge treatment, a low temperature plasma treatment, and a flame treatment, which are conducted in various atmospheres, are valuable. As the gas to be used for these treatments, various gases such as oxygen,

nitrogen, argon, hydrogen, neon, ammonia, steam, helium, carbon dioxide, nitrogen dioxide, carbon monoxide, nitrogen monoxide, ozone, sulfur dioxide and hydrogen sulfide are effective. Mixtures of two or more of these gases are often especially effective.

The meaning understood from this statement is that any one of three different chemical treatments can be used to improve adhesion, and any one of them can be conducted in a gaseous atmosphere comprising one or more of the listed gases. The nature of an atmosphere – a medium surrounding a body – is well understood for each of the chemical treatments: a corona discharge is applied through an atmosphere that surrounds the article being treated; a low temperature plasma is similarly applied to an article through an atmosphere; and a flame applied to an article is surrounded by an atmosphere.

Applicants' invention is directed to a flame treatment, but in distinction from Asakura, applicants' invention does not involve the atmosphere that surrounds the flame. Instead of an atmosphere, applicants' invention involves the gases fed directly to the flame to support the flame. Applicants found that a flame supported by a fuel mixture that includes a sulfur-containing compound as a fuel achieves new, surprising and beneficial modifications to the surface of a polymeric substrate against which the flame is directed.

Several indications make clear that Asakura is not concerned with the gases fed to a flame to support the flame, but instead is directed to the atmosphere that surrounds the flame. First is the clear meaning of the word atmosphere, which is the only term in the disclosure describing the way the gases are used. Second, none of the gases listed are those that would be normally used to support a flame. According to the known prior art, a flame is normally supported with hydrocarbon gases, but no hydrocarbon gas is listed in Asakura. The only gas listed in Asakura that is commonly used in combustible mixtures is hydrogen, but that use is very specialized – e.g., for rocket fuels – and is not used for a flame treatment. If Asakura were thought to be describing gases to be used as fuels in a flame treatment, he leaves out the most important and really necessary gases from the description.

The mention of flame treatment in column 9, lines 52 and 53 of Asakura is the only mention of flame treatment in the entire patent. There is no exemplification of a flame treatment in the patent.

The only treatments spoken of in any detail in Asakura further confirm that Asakura's teaching is directed to an atmosphere; see, col. 11, lines 20-27 and col. 16, lines 32-60. The treatments described in these sections of Asakura are well known treatments and, as explicitly stated by Asakura (col. 11, l. 21, and col. 16, ll. 59-60), the treatments involve an atmosphere selected from the gases listed by Asakura in column 9, lines 54-58.

All of the indications in Asakura – the absence from the listed gases of the gases necessary for supporting a flame; the absence of any exemplification of a flame treatment; the grouping of the briefly mentioned flame treatment with other chemical treatments in which gases are used as part of an atmosphere; the explicit statement that the various treatments, including flame treatment, are “conducted in various atmospheres”; the immediate listing of the specific illustrative gases after recitation that the treatments are “conducted in various atmospheres” – are consistent with one another. They convey only one meaning to a skilled reader: column 9, lines 48-60 teaches, with respect to flame treatments, that some of the listed gases could be used in an atmosphere for the flame treatment.

The Asakura disclosure is a kind of shotgun disclosure in which a number of gases for atmospheres are listed together with three different kinds of chemical treatment. Not all the gases are useful as atmospheres for all the three treatments. At the interview, the undersigned presented a sheet, attached hereto as Attachment A, which lists on the left-hand side the three chemical treatments that are recited in the quoted Asakura disclosure, and lists on the right-hand side the 15 gases recited by Asakura to be used for these treatments. The gases are grouped and categorized according to the chemical activity they would exhibit when exposed to a flame. Four of the gases would be

oxidizers, four would be inert, four would be flammable (though as discussed above none of them would be the main ingredient in supporting a flame treatment performed on a polymeric substrate), and three would be extinguishing agents of a flame.

It is clear from this listing that a person skilled in the art would need to pick and choose from this list to find gases useful for the atmosphere surrounding a flame treatment. A skilled person could find some gases useful in an atmosphere for a flame treatment: for example, some of the inert gases (e.g., nitrogen or argon) could be used in an atmosphere to purge the atmosphere of unwanted gases. Importantly, none of the flammable gases listed would be used in the atmosphere around a flame, because that would create an uncontrolled explosive situation.

Applicants' invention, as recited in claim 1, involves use of a flame that "is supported by an oxidizer and fuel mixture that includes at least one sulfur-containing compound that functions as a fuel substitute." The list of gases in Asakura does include hydrogen sulfide, but there is no teaching of using that gas to support a flame as called for by applicants. There is no teaching at all in Asakura about how to support a flame. Hydrogen sulfide is undoubtedly included in Asakura's list because it is useful in an atmosphere for a low temperature plasma treatment; such a use is acknowledged by applicants on page 2, lines 21-23.

Applicants teach a new method that goes beyond anything in Asakura, namely that inclusion of sulfur-containing compounds as part of the fuel and oxidizer mixture that supports a flame applied against a polymeric substrate will achieve a unique and beneficial modification of the surface. Asakura has no teaching of use of sulfur-containing compounds to support a flame, and has no teaching about improvements in surface modifications. And, of course, there is no teaching in Asakura of the details of a flame treatment – e.g., no teaching of the main gaseous ingredient of a flame – such as to enable or suggest an invention like applicants'.

Applicants' invention is an advance in the art, by which superior surface modifications never before achieved are made possible. Skilled readers of Asakura would not come away with an understanding of applicants' invention. Asakura is completely silent with respect to any use of a sulfur-containing compound in a flame treatment of a polymeric substrate. Because each of the rejections depends on Asakura, and because Asakura is completely silent about a key feature of applicants' invention, the rejections cannot be sustained.

It is accordingly believed that this application is in condition for allowance, and a notice to that effect is respectfully solicited.

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Respectfully submitted,

By


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Attachment A

Gases named in
Asakura grouped by
category

Oxidizers

Oxygen

Ozone

Nitrogen monoxide

Nitrogen dioxide

Inert

Nitrogen

Argon

Helium

Neon

Fuel

Hydrogen

Ammonia

Carbon monoxide

Hydrogen sulfide

Extinguishing
agent

Steam

Carbon dioxide

Sulfur dioxide
(probably)

CORONA DISCHARGE TREATMENT

LOW TEMPERATURE PLASMA TREATMENT

FLAME TREATMENT